Airspan / NTIA response

Public Wireless Supply Chain
Innovation Fund Implementation

The $1.5bn Open RAN investment aims to support US leadership in the global telecommunications ecosystem, foster competition, lower costs for consumers and network operators, and strengthen our supply chain.

This Notice particularly welcomes comment on: (1) practical solutions to the key challenges to adoption of open and interoperable, standards-based RAN; (2) recommendations for the kinds of projects that the Innovation Fund should support; and (3) the kinds of criteria that should inform how Innovation Fund grants are awarded.

Questions on the State of the Industry

Understanding the current state of the telecommunications industry is important to determining how any topics should be prioritized in the Innovation Fund, and what level of funding a topic should receive.

1. What are the chief challenges to the adoption and deployment of open and interoperable, standards-based RAN, such as Open RAN? Are those challenges different for public vs. private networks?

We believe challenges are different from public vs private networks.
Private Networks care more about fixing an issue without getting into the details of the technology behind (Open RAN vs Legacy). There are some use cases that Open RAN brings benefit, like in big indoor deployments, where the disaggregation of the RAN and centralization of the software brings advanced features to mitigate interference.
Open RAN has an easy path to enter this market and we have already deployed several Open RAN private networks.

Public networks is a different story. There are many blockers, mainly:

- **Lack of take up from operators.** While governments across the world are increasingly committing to trials and funding for Open RAN, few telcos have adopted the technology. Airspan has a long-term relationship with Rakuten with whom we deployed the world's first commercial Open RAN network in Tokyo. However, this is an outlier. Telcos continue to rely on a small number of vendors which reduces competition, raises costs, and harms network security.

  Reasons behind the lack of take-up include:

- **Lack of confidence.** While multiple R&D Open RAN labs operate in the US and elsewhere, few labs have taken the next step of deploying commercially active large-scale trials. Operators therefore still argue that there is insufficient evidence to prove the capabilities and benefits of Open RAN. The major US wireless operators have remained silent on Open RAN to date.

- **Incumbent positioning.** As operators have an existing suite of equipment, it can often be a costly process to replace equipment, even when transitioning from 4G to 5G / 6G networks. They therefore look to protect their existing investments in traditional RAN due to short-term costs, even though in the longer term this would enhance security and reduce costs.

- **Need for further regulation.** US policy around Open RAN remains incomplete, and a strong commitment to adopting Open RAN must be made to incentivise adoption. It's encouraging to see Government departments – such as the Department of Defense through its '5G Challenge' programme – looking to adopt Open RAN, but a more holistic approach is needed. An example that could be followed is the UK Government's ambition for 35% of mobile traffic to be carried over Open RAN architecture by 2030. A way to ensure a gradual shift towards Open RAN could include introducing 'staging posts' in the coming years (i.e. 20% in 2025, 25% in 2027, etc.).

a. What are the challenges for brownfield deployments, in which existing networks are upgraded to incorporate open, interoperable, and standards-based equipment?

Brownfields challenges are self-imposed. Operators have taking the approach to use a non-standalone architecture for 5G, which depends on the existing 4G infrastructure. The problem is that another 5G RAN vendor won't work the legacy 4G network, since legacy vendor won't open their interfaces (X2) to work with the new 5G radios.
The solution is to move to Stand Alone networks, where 5G is totally independent of legacy 4G.

A big opportunity for Open RAN is given by the Huawei ban process. Normally operators divide the country in different regions and assign them to specific vendors. Having Huawei leaving a complete region, this open an opportunity to new Open RAN vendors to take it instead of legacy vendors.

2. What ongoing public and private sector initiatives may be relevant to the Innovation Fund?

a. What gaps exist from an R&D, commercialization, and standards perspective?

b. How might NTIA best ensure funding is used in a way that complements existing public and private sector initiatives?

Funding should focus on accelerating Open RAN technology gaps, together with Carriers/System Integrators adopting this architecture

On the public side, we believe that an urban trial could bring many benefits:

I. A large-scale urban trial is the next step towards fully deploying Open RAN networks - it is an opportunity for participants to test their products in a collaborative, full-scale environment. Making this technology work in these environments will be critical for MNOs to take Open RAN as a seriour option.
II. The Government needs to refocus its 5G funding away from academic trials, and onto those projects that can accelerate and deliver on the 5G rollout.
III. The use of an urban area ensures a large and active user base to effectively highlight the benefits of Open RAN, including increased security, higher competition, lower costs and accelerated innovation.

On the private network side we believe that funding should focus on developing key features for this market (Location services, URLLC, QoS, Network Slicing, etc). bringing more efficient hardware components (developing specific ASICs or even "look-aside" L1 acceleration) and simplifying integration in a multi-vendor architecture (creating standard configurations for the open interfaces)

3. What kind of workforce constraints impact the development and deployment of open and interoperable, standards-based RAN, such as Open RAN? How (if at all) can the Innovation Fund help alleviate some of these workforce challenges?

We need support through funding to draft integration blueprints for the different Open interfaces. This could speed up the overall process of interoperability between vendors.

Creating open libraries of software code for specific interfaces (Like E2 for the RIC) or Open RAN features for RAN vendors to adopt them and accelerate Open RAN readiness

4. What is the current climate for private investment in Open RAN, and how can the Innovation Fund help increase and accelerate the pace of investment by public and private entities?

- **Globally, private investment in Open RAN is mixed.** According to Dell'Oro Group, 2022 Q3 sales doubled year-on-year, and Open RAN is expected to account for 6-10% of the total RAN market in 2023[1]. However, the RAN market remains dominated by a small number of players, with the big five being Huawei, Ericsson, Nokia, ZTE, and Samsung. Targeting Government action to support diversification would help deliver domestic investment and US jobs, and improve the resilience and security of US network supply chains.

- **Vendor take-up is not uniform.** Of these five vendors, Huawei remains publicly opposed to Open RAN, and Ericsson has no Open RAN offer. However, other vendors are beginning to offer Open RAN products, with Samsung being the biggest Open RAN provider. Samsung's work has been demonstrated recently through its partnership with Vodafone to deploy the first commercially active Open RAN network in the UK in January 2022[2].

- **There has been some recent movement on Open RAN in the US.** AT&T and Verizon are both members of the Open RAN Policy Coalition. AT&T is working on a large-scale RIC trial in New

[1] Dell'Oro Group, 'Nokia and ZTE Gain Share', 11/23/2022 (link)
[2]Samsung, 'Vodafone UK and Samsung Switch on First 5G Open RAN Site in the United Kingdom', 01/19/2022 (link)

Jersey with Nokia[3]. Meanwhile, Verizon has promised an Open RAN deployment by 2023, and sees itself as a leader in the vRAN space, having deployed more than 8,000 vRAN sites[4].

5. How do global supply chains impact the open, interoperable, and standards-based RAN market, particularly in terms of procuring equipment for trials or deployments?

We are impacted at all levels: 3rd party servers to host our software, SFPs, FPGAs, HW Accelerators, etc.

Questions on Technology Development and Standards

Understanding the current state of open and interoperable, standards-based RAN and the standards that inform its development will assist NTIA in maximizing the impact of grants. Questions in this section will be used to assess the maturity of the technology and related standards to help determine which topics should receive additional investment.

6. What open and interoperable, standards-based network elements, including RAN and core network elements, would most benefit from additional research and development (R&D) supported by the Innovation Fund?

RIC (RAN Intelligent Controller). Development of E2 interface as an open source library.
RAN Interoperability. Support vendors to create blueprints of open interfaces configuration to reach a plug&play situation.
Specific support, testing for upcoming features in the ecosystem: Location Based Services, URLLC, Network Slicing, etc.

7. Are the 5G and open and interoperable RAN standards environments sufficiently mature to produce stable, interoperable, cost-effective, and market-ready RAN products? If not:

A good example of maturity is Rakuten Network in Japan. A fully virtualized Open RAN network with millions of commercial users.
But still more need to be done in terms of RAN interoperability, energy efficiency, advanced features support for Open RAN

a. What barriers are faced in the standards environment for open and interoperable RAN?

- **Debate over what constitutes Open RAN.** A core reason behind the need for clear and thorough standards is that operators can describe their networks as Open RAN compliant without actually combining equipment from multiple vendors. This negates the benefits of Open RAN such as opening the market to smaller vendors, reducing costs, and ensuring network security. For example, some analysts saw a network deployed in the UK as not being wholly Open RAN as only Nokia was used, and other vendors weren't invited to contribute[5].

[3]*Sdxcentral*, 'AT&T's vRAN Test With Nokia Emboldens Open RAN Vision', 03/10/2021 (link)
[4]Verizon, 'Verizon deploys more than 8,000 VRAN cell sites, rapidly marches towards goal of 20,000', 09/12/2022 (link)
[5]*FierceWireless*, 'BT, Nokia trial fuels bitter battle over open RAN', 02/02/2022 (link)

b. What is required, from a standards perspective, to improve stability, interoperability, cost effectiveness, and market readiness?

c. What criteria should be used to define equipment as compliant with open standards for multivendor network equipment interoperability?

8. What kinds of projects would help ensure 6G and future generation standards are built on a foundation of open and interoperable, standards-based RAN elements?

- **Commercial deployment.** In order to ensure operator confidence in Open RAN for 6G and future networks, it will be important to demonstrate that 5G networks using Open RAN architecture are fully functional. Focusing Government activity on supporting initiatives which give private companies the confidence to invest will be crucial to seizing the economic and security benefits offered by this new technology.

- **Dense urban trial.** As a priority, the Government should incentivise trials that go beyond R&D labs, and that bring in network operators as partners. These should focus on the most challenging (and potentially useful) use cases - most notably dense urban environments - and have generous funding ratios to ensure that operators are incentivized to participate. This will be a key element to demonstrating Open RAN's maturity.

Questions on Integration, Interoperability, and Certification

Challenges associated with systems integration and component interoperability can hinder the adoption of open and interoperable, standards-based RAN. This section will help NTIA structure the NOFOs in a way that most effectively addresses these challenges and facilitates adoption. NTIA also welcomes feedback on the effectiveness of certification regimes in driving open and interoperable, standards-based RAN adoption.

9. How can projects funded through the Innovation Fund most effectively support promoting and deploying compatibility of new 5G equipment with future open, interoperable, and standards-based equipment?

- Projects funded through the Innovation Fund could include the following to effectively support promoting and deploying interoperable 5G equipment:

    - **Security testbeds.** A lab bringing together operators, vendors, and academia can help finalize and verify the security aspects of networks running on Open RAN architectures. This is being done elsewhere, for example the UK Government has announced the launch of its 'Telecommunications Lab' to boost the security, resilience, and performance of the UK's mobile networks[6].

    - **Vendor / RIC testbeds and labs.** In order to promote collaboration between vendors and thus develop the core element of Open RAN – ensuring interoperability of parts – the

[6]UK Government, 'Government announces cutting-edge new telecoms lab for Solihull', 10/14/2022 (link)

Innovation Fund should create environments where vendors can test their equipment with others in the industry. Again, the UK Government is playing a leading role here through its SONIC Labs initiative[7].

- **Dense urban trial.** As mentioned above, an urban trial will be required to demonstrate the commercial viability of Open RAN equipment.

a. Are interoperability testing and debugging events (E.g., "plugfests") an effective mechanism to support this goal? Are there other models that work better?

A better model would be to fund real commercial use cases using this technology instead of science/ad-hoc projects

10. How can projects funded through the program most effectively support the "integration of multi-vendor network environments"?

11. How do certification programs impact commercial adoption and deployment?

a. Is certification of open, interoperable, standards-based equipment necessary for a successful marketplace?

b. What bodies or fora would be appropriate to host such a certification process?

12. What existing gaps or barriers are presented in the current RAN and open and interoperable, standards-based RAN certification regimes?

a. Are there alternative processes to certification that may prove more agile, economical, or effective than certification?

b. What role, if any, should NTIA take in addressing gaps and barriers in open and interoperable, standards-based RAN certification regimes?

- **International collaboration.** We welcome the Government's work to date on collaborating internationally on open standards – for example, through its recent approval of the UK Government's four Open RAN principles. It should continue to do this by working with bodies such as 3GPP and the O-RAN Alliance to ensure the US remains a global standards setter in this emerging space.

Questions on Trials, Pilots, Use Cases, and Market Development

A key aim of the Innovation Fund is to promote and deploy technologies that will enhance competitiveness of 5G and successor open and interoperable, standards-based RAN. We have seen a

[7]Digital Catapult, 'SONIC Labs' (link)

range of Open RAN trials, pilots, and use cases underway across the United States and internationally to date. This section will inform the types of NOFOs NTIA publishes and administers as the Department works to accelerate adoption.

13. What are the foreseeable use cases for open and interoperable, standards-based networks, such as Open RAN, including for public and private 5G networks? What kinds of use cases, if any, should be prioritized?

Open RAN has a number of use cases, and Airspan is at the forefront of development and deployment. This includes:

- **The world's first public Open RAN network** in Tokyo. We have deployed tens of thousands of small cells in the first fully virtualized commercial network in the world, through our partnership with Rakuten.

- **Private 5G Open RAN networks** deployed across the world in a number of sectors, including:

    - **Transport and logistics.** We have: worked with the UK Government at a port in Bristol to improve the security, traceability, and real-time tracking of goods in a Freeport and Freezone scenario; provided private networks for Wismar Seaport in Germany, which enabled the port to operate its own radio network and autonomous vehicles across a 60ha site, helping to handle the 8m tonnes of goods that transit through Wismar every year; and setting up a 5G campus network at the ZF Jeversen autonomous vehicle test track in Germany, which allowed it to run complex test scenarios at a consistently low latency and with excellent reliability.

    - **Industry.** We have: demonstrated the viability of VR, the monitoring of time-sensitive assets, and the real-time monitoring of manufacturers such as Boeing and Airbus in a government-funded trial in the UK; worked with Betacom to provide the first ever indoor 5G private network for MxD, the Digital Manufacturing Institute, and the National Center for Cybersecurity in Manufacturing, at their Factory Floor Lab and headquarters in Chicago; and provided a 5G private network at the Fiskarheden sawmill in Sweden which offered the capacity needed to run the facility's existing industrial processes from, and offered the flexibility needed to quickly deploy new ones as well.

    - **Smart cities.** We have: worked with Qualcomm in Atlanta to help manage traffic in an area through which 45,000 cars pass every day, including through 'Cellular Vehicle-to-Everything' (C-V2X) technology which allows vehicles and surrounding road infrastructure to communicate directly with one another; and, supported BAI Communications in deploying a smart city in Sunderland, UK, with our small cells being used to support facilities including a major Nissan factory, and the digitalisation of schools.

14. What kinds of trials, use cases, feasibility studies, or proofs of concept will help achieve the goals identified in 47 U.S.C. 906(a)(1)(C), including accelerating commercial deployments?

a. What kinds of testbeds, trials, and pilots, if any, should be prioritized?

- **Dense urban Open RAN trial.** As mentioned above, trials that go beyond R&D labs are crucial, especially with network operators as partners. These should have generous funding ratios to ensure that operators are incentivized to participate, and will be a key element to demonstrating Open RAN's maturity.

15. How might existing testbeds be utilized to accelerate adoption and deployment?

16. What sort of outcomes would be required from proof-of-concept pilots and trials to enable widespread adoption and deployment of open and interoperable, standards-based RAN, such as Open RAN?

Questions on Security

Strengthening supply chain resilience is a critical benefit of open and interoperable, standards-based RAN adoption. In line with the Innovation Fund's goal of "promoting and deploying security features" to enhance the integrity and availability of multi-vendor network equipment, and Department priorities outlined in the National Strategy to Secure 5G Implementation Plan, this section will inform how NTIA incorporates security into future Innovation Fund NOFOs.

17. "Promoting and deploying security features enhancing the integrity and availability of equipment in multi-vendor networks," is a key aim of the Innovation Fund (47 U.S.C 906(a)(1)(C)(vi)). How can the projects and initiatives funded through the program best address this goal and alleviate some of the ongoing concerns relating to the security of open and interoperable, standards-based RAN?

a. What role should security reporting play in the program's criteria?

b. What role should security elements or requirements, such as industry standards, best practices, and frameworks, play in the program's criteria?

18. What steps are companies already taking to address security concerns?

19. What role can the Innovation Fund play in strengthening the security of open and interoperable, standards-based RAN?

- **Security testbeds.** As mentioned above, a lab bringing together operators, vendors, and academia can help finalize and verify the security aspects of networks running on Open RAN architectures. This is being done elsewhere, for example the UK Government has announced the launch of its 'Telecommunications Lab' to boost the security, resilience, and performance of the UK's mobile networks.

20. How is the "zero-trust model" currently applied to 5G network deployment, for both traditional and open and interoperable, standards-based RAN? What work remains in this space?

Questions on Program Execution and Monitoring

The Innovation Fund is a historic investment in America's 5G future. As such, NTIA is committed to developing a program that results in meaningful progress toward the deployment and adoption of open and interoperable, standards-based RAN. To accomplish this, we welcome feedback from stakeholders on how our program requirements and monitoring can be tailored to achieve the goals set out in 47 U.S.C. 906.

21. Transparency and accountability are critical to programs such as the Innovation Fund. What kind of metrics and data should NTIA collect from awardees to evaluate the impact of the projects being funded?

22. How can NTIA ensure that a diverse array of stakeholders can compete for funding through the program? Are there any types of stakeholders NTIA should ensure are represented?

23. How (if at all) should NTIA promote teaming and/or encourage industry consortiums to apply for grants?

24. How can NTIA maximize matching contributions by entities seeking grants from the Innovation Fund without adversely discouraging participation? Matching requirements can include monetary contributions and/or third-party in-kind contributions (as defined in 2 CFR 200.1).

25. How can the fund ensure that programs promote U.S. competitiveness in the 5G market?

a. Should NTIA require that grantee projects take place in the U.S.?

b. How should NTIA address potential grantees based in the U.S. with significant overseas operations and potential grantees not based in the U.S. (I.e., parent companies headquartered overseas) with significant U.S.-based operations?

- **Domestic vendors should be prioritized.** Given the core aim of open networks being enhanced security, it is crucial that vendors are based in the US, or at least in a Five Eyes nation. No parts of a vendor's supply chain should be based in a country which poses potential security risks. This will ensure that the US's critical national infrastructure will not be dependent upon a vendor such as Huawei again.

c. What requirements, if any, should NTIA take to ensure "American-made" network components are used? What criteria (if any) should be used to consider whether a component is "American-made"?

26. How, if at all, should NTIA collaborate with like-minded governments to achieve Innovation Fund goals?

- **Standards-based collaboration.** As noted above, we welcome the Government's work to date on collaborating internationally on open standards – for example, through its recent approval of

the UK Government's four Open RAN principles. It should continue to do this by working with bodies such as 3GPP and the O-RAN Alliance.

- **Funding collaboration.** Governments, especially in Europe and Asia, are looking to drive the development and adoption of Open RAN through collaborative projects. An example of this can be seen in the UK and Republic of Korea's £3.6m Open RAN R&D competition which was finalized in December 2022[8].

Additional Questions

NTIA welcomes any additional input that stakeholders believe will prove useful to our implementation efforts.

27. Are there specific kinds of initiatives or projects that should be considered for funding that fall outside of the questions outlined above?

28. In addition to the listening session mentioned above and forthcoming NOFOs, are there other outreach actions NTIA should take to support the goals of the Innovation Fund?

[8] UK Government, 'The UK & Republic of Korea Open RAN R&D Collaboration Competition Winners', 12/13/2022 (link)